Annals of Clinical and Analytical Medicine
Original Research

Evaluation of the use of three ports in total laparoscopic hysterectomies

Laparoscopic hysterectomy with three ports

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Abstract

Aim: The aim of this study is to evaluate the patient profile in which fewer ports can be used in laparoscopic hysterectomy.

Material and Methods: The study is based on cases performed by a team experienced in laparoscopic hysterectomy in a tertiary education and research hospital. Variables of patients were collected retrospectively from hospital electronic medical databases and analyzed. The use of 4 ports and 3 ports in laparoscopic hysterectomy was compared in terms of uterine weights, blood parameters and complications.

Results: Of a total of 201 patients, 28% (56) were operated using 4 ports (port-4 group), 72% (145) using 3 ports (port-3 group). The mean age of the patients was 49.03 (±4.53) years. Mean gravida, parity, and history of abdominal surgery were similar in both groups. Preoperative and postoperative hematocrit and hemoglobin values were similar in both groups. Although the need for blood transfusion was higher in the port-4 group (13%) than in the port-3 group (6.9%), no significant difference (p=0.26) was observed. Mean uterine weight (gr) was found to be significantly (p<0.001) lower in the port-3 group (193.03±45.60) than in the port-4 group (237.25±57.16). Total operation time (min) was significantly shorter (p<0.001) in the port-3 group (68.52±14.94) compared to the port-4 group (91.91±23.96). Postoperative complication rates were similar in both groups.

Discussion: Laparoscopic hysterectomies may be associated with a reduced number of ports, shorter operation time and less need for blood transfusion in patients with a smaller uterus.

Keywords

Laparoscopy, Hysterectomy, 3-Port

DOI: 10.4328/ACAM.21796 Received: 2023-06-20 Accepted: 2023-08-30 Published Online: 2023-08-30 Printed: 2023-09-01 Ann Clin Anal Med 2023;14(9):816-820
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This study was approved by the Clinical Research Ethics Committee of Karatay University Faculty of Medicine (Date: 2023-05-25, No: 2023/029)

Introduction

Today, minimally invasive surgery is preferred in most of the gynecological surgeries [1]. Many studies have shown many advantages of laparoscopic surgery over abdominal surgery, such as shorter hospital stay, shorter return to normal life, less infection rate, less pain, and better cosmetic results [2,3]. Hysterectomy is the most common surgical procedure in women. The most common indications for hysterectomy are unresponsive to medical therapy menorrhagia, leiomyoma, adenomyosis, prolapse of the pelvic organs, and chronic pelvic pain [4]. Although the type of hysterectomy operation depends on many factors such as the surgeon's experience, uterus size, previous surgeries, and technical equipment, it is the most preferred minimally invasive surgery today [5]. Laparoscopic hysterectomy rates, which accounted for only 1% of all hysterectomies in the 1990s, have reached 30% in many countries today [6].

With the development of knowledge and technology over the years, the importance of minimally invasive surgery, especially in terms of complications, has been understood in conditions such as adhesions due to previous surgeries, a large uterus with multiple fibroids and obesity [7]. In laparoscopic hysterectomy, usually 4 or more ports can be used depending on the size of the uterus or the condition of intra-abdominal adhesions [8]. Since the benefits of minimally invasive surgery in terms of patient health and comfort are seen, it seems inevitable that the current procedure will evolve for the better. In this direction, applications such as reducing the abdominal entrance incisions or reducing the diameter of the ports are on the agenda. Evidence suggests that reducing port entries demonstrated comparable complication rates and reduced postoperative immediate pain [9]. In particular, to reduce the number of ports, alternatives include 2-port, multi-channel and single-port hysterectomy procedures [10,11]. Problems such as loss of triangulation and hand collision have emerged in single-port hysterectomy surgeries [12]. In addition, a large meta-analysis showed that although multiport laparoscopy from a single site found better cosmetic results, the operative time was increased [13]. While 2-port multi-channel techniques provided better triangulation, it was found to be associated with more postoperative pain due to the larger fascial defect [14, 15].

The aim of this study is to evaluate the results of total laparoscopic hysterectomy using three single-channel ports, including the camera port, in patients with increased uterine weight due to uterine myomatosis and/or adenomyosis, by comparing them with those using classical four ports.

Material and Methods

Study design

This study is a retrospective analysis of laparoscopic hysterectomy performed for benign reasons. The data of 243 patients who underwent total laparoscopic hysterectomy between January 2017 and December 2020 in Konya Training and Research Hospital, a tertiary hospital, were retrospectively analyzed from the hospital database. This study was planned after the approval of Karatay University Faculty of Medicine Clinical Research Ethics Committee (2023/029).

Data collection

Demographic and clinical characteristics of the patients included in the study, such as age, pregnancy history, menopausal status, previous abdominal surgeries, surgery indications, uterine specimen weights, intraoperative and postoperative complications, blood parameters and blood transfusion need, were recorded from the database. Patients who had undergone surgery for uterine myoma and adenomyosis and whose records were complete were included in the study. Possible malignancies were excluded by performing fluid-based cytology and endometrial sampling before surgery in all patients. A total of 201 patients were included in the study, excluding patients who had undergone supracervical hysterectomy, patients with pelvic organ prolapse requiring additional surgical repair, and patients requiring surgery for endometriosis or adnexal tumors. The patients were divided into 2 groups according to the single-channel three or four-port ports used during the operation, and all variables were compared between the two groups.

Definitions

Definitions The operations were performed by the same surgical team experienced in laparoscopic surgery, accredited by the Turkish Society of Minimally Invasive Gynecology, and certified in advanced endoscopic surgery [available at: http://minimalinvazivjinekolojikcerrahi.org].

In all operations, after endotracheal intubation under general anesthesia, the patients were placed in the lithotomy position and the arms were folded. After urinary catheterization and patient preparation, a 10 mm trocar was placed 3-5 cm above the umbilicus according to the size of the uterus, pneumoperitoneum was created, and then a 30° laparoscope was inserted through this port. In the Port-4 group, 2 ipsilateral 5mm trocars were placed on the left abdominal side walls and the last 5mm trocar was placed on the right abdominal wall [16]. In the Port-3 group, only 2 ipsilateral 5 mm trocars were placed on the left abdominal lateral wall. Abdominal lateral wall trocars were placed lateral to the inferior epigastric vessels [16]. In all cases, the same uterine manipulator, the rod of which was made of non-conductive material, was used and set to zero, completely covering the cervix and vagina. After the uterine manipulator and trocars were placed, classical hysterectomy steps were performed in both groups. With or without oophorectomy, bilateral salpingectomy was performed in both groups, and the first step was separation and closure of the ligamentum rotundum, followed by bladder dissection and vesicouterine space opening. By taking the uterus into lateral traction, the anterior leaf of the Broad ligament is opened parallel to the infundibulopelvic ligament with the help of bipolar forceps. A window is created in the posterior leaf of the broad ligament, medial to the ureter, under direct view of the ureters. If the ovaries are to be removed, the peritoneum is released from the lateral side of the gonadal vessels on both sides so that the ureter is fully visible. The gonadal vessels are then dried and cut with bipolar current. If the ovaries are to be left intact, the utero-ovarian ligament is sealed and cut on both sides. After the bladder flap is sharply created, the uterine arteries are sealed and cut with bipolar current. After adequate bladder dissection, the vaginal cuff is exposed and cut with

a monopolar hook. After the uterus is released, it is removed vaginally and the vaginal cuff is sutured vaginally with No. 1 vicryl. In the first observation, in patients with intra-abdominal adhesions, adhesiolysis was performed using cold scissors or bipolar forceps. The total time to surgery was defined as the time from incision to closure.

Both groups were compared in terms of demographic characteristics, operation time, uterine weight, pre-/post-operative blood parameters, need for blood transfusion, and intra- and postoperative complications.

Statistical analysis

Mean and standard deviation for numerical variables, Frequency and percentage were used for categorical variables. T-test, Chi-square and Fisher tests were used for the analysis of numerical variables. Exact test was used in the analysis of categorical variables.

Analyzes were made with the R 4.2.2 program and $p<0.05$ was considered significant.

Ethical Approval

Ethics Committee approval for the study was obtained.

Results

A total of 201 patients who underwent laparoscopic hysterectomy and met the inclusion criteria were analyzed for the study. Clinical and demographic characteristics are given in

Table 1. General demographic and clinical characteristics.

Variables	n = 201[1]
Number of ports (n, %)	
Port-3	145 (72%)
Port-4	56 (28%)
Age (years), mean (SD)	49.03±4.53
Gravidity, mean (SD)	3.32±1.25
Parity, mean (SD)	2.81±1.07
Menopause status (n, %)	
Yes	20 (10.0%)
No	181 (90%)
Previous Laparotomy (n, %)	
Prev.surgery 0	131 (65%)
Prev.surgery 1	28 (14%)
Prev.surgery >2	42 (21%)
Preoperative hematocrit (%)	36.90±3.43
Preoperative hemoglobin	12.00±1.23
Postoperative hematocrit (%)	33.83±3.69
Postoperative hemoglobin	10.80±1.27
Uterine weight (g), mean (SD)	205.35±52.83
Total time in Surgery (minutes)	75.03±20.72
Oophorectomy, n (%)	96 (48%)
Lysis of adhesion, n (%)	57 (28%)
Intraoperative complications, n (%)	1 (0.49%)
Recent pathology, n (%)	
Adenomyosis	35 (17%)
Uterine Myomatosis	134 (67%)
Uterine Myomatosis + Adenomyosis	32 (16%)
Blood transfusion, n (%)	17 (8.5%)
Postoperative complications, n (%)	2 (1.0%)

1n (%); Mean±SD

Table 2. Comparison of characters according to the port numbers.

Variables	Ports-3, n = 145[1]	Ports-4, n = 56[1]	p-value[2]
Age (years), mean (SD)	49.46±4.74	47.93±3.76	0.018
Gravidity, mean (SD)	3.38±1.32	3.16±1.04	0.22
Parity, mean (SD)	2.89±1.11	2.61±0.97	0.077
Menopause status (n, %)	17 (12%)	3 (5.4%)	0.18
Previous Laparotomy (n, %)	49 (34%)	21 (38%)	0.62
Prev.surgery 0	96 (66%)	35 (63%)	
Prev.surgery 1	20 (14%)	8 (14%)	
Prev.surgery >2	29 (20%)	13 (23%)	0.86
Preoperative hematocrit (%)	36.93±3.45	36.83±3.42	0.86
Preoperative hemoglobin	12.01±1.22	11.97±1.25	0.85
Postoperative hematocrit (%)	34.05±3.58	33.25±3.94	0.19
Postoperative hemoglobin	10.88±1.25	10.58±1.31	0.14
Uterine weight (g), mean (SD)	193.03±45.60	237.25±57.16	<0.001
Total time in Surgery (minutes)	68.52±14.94	91.91±23.96	<0.001
Oophorectomy	74 (51%)	22 (39%)	0.13
Lysis of adhesion, n (%)	38 (26%)	19 (34%)	0.28
Intraoperative complications, n (%)	0 (0%)	1 (1.8%)	0.077
Operation indication, n (%)			
Adenomyosis	27 (19%)	8 (14%)	0.032
Uterine Myomatosis	101 (70%)	33 (59%)	
Uterine Myomatosis + Adenomyosis	17 (12%)	15 (27%)	
Blood transfusion, n (%)	10 (6.9%)	7 (13%)	0.26
Postoperative complications, n (%)	1 (0.7%)	1 (1.8%)	0.48

1Mean±SD; n (%),2Welch Two Sample t-test; Pearson's Chi-squared test; Fisher's exact test

Table 1. The mean age of the patients was 49.03±4.53, mean gravida 3.32±1.25 and parity 2.81±1.07. Of the patients, 28% (56) were operated using four ports and 72% (145) using three ports. The most common indication for laparoscopic hysterectomy was uterine myomatosis (134, 67%). Other pathologies were adenomyosis (17%; 35) and coexistence of uterine myomatosis and adenomyosis (16%; 32). The mean uterine specimen weight of all patients was 205.35±52.83. Blood transfusion was performed in 8.5% of the patients. Intraoperative complication was detected in one patient, and postoperative complications in two patients (Table 1). None of the patients underwent laparotomy, and the intraoperative bladder defect in one patient in the port-4 group was repaired laparoscopically. Minor cuff hematoma that developed in 2 patients within the first 10 days after surgery was followed up on an outpatient basis until it resolved spontaneously without the need for additional intervention.

Table 2 shows the comparison of the characters according to the port numbers. The mean age was 47.93±3.76 years in the port-4 group and was significantly (p=0.018) lower than in the port-3 group. Gravida, parity, menopausal status, and history of laparotomic abdominal surgery were similar in both groups (p= 0.22, p= 0.077, p=0.18, p=0.62, respectively). Preoperative and postoperative hematocrit and hemoglobin values were

similar in both groups. Although the need for blood transfusion was higher in the port-4 group (13%) than in the port3 group (6.9%), no significant difference (p=0.26) was observed. Cases undergoing oophorectomy and adhesiolysis during TLH were similar in both groups (p=0.13, p=0.28, respectively). While intraoperative complication was not observed in the port-3 group, it was observed in one case (1.8%) in the port-4 group and was not significant between the groups (p=0.077). Postoperative complications were seen in one case in each group (Port-3 0.7%, Port-4 1.8%) and there was no significant difference between the groups (p=0.48). Mean uterine weight (gr) was found to be significantly (p<0.001) lower in the port-3 group (193.03±45.60) than in the port-4 group (237.25±57.16). Total operation time (min) was significantly shorter (p<0.001) in the port-3 group (68.52±14.94) compared to the port-4 group (91.91±23.96). Patients with only adenomyosis and only uterine myomatosis had higher rates in the port-3 group (19%, 70%, respectively) than in the port-4 group (14%, 59%, respectively). On the other hand, patients with uterine myomatosis and adenomyosis were observed higher in the port-4 group (27%) than in the port-3 group (12%). These differences in the indications of the operations were statistically significant (p=0.032) (Table 2).

Discussion

Today, even in minimally invasive surgery, new surgical techniques and equipment continue to be developed for less pain, less complications, same day discharge, less cost and much better cosmetic results. Attempts to reduce the number of ports in laparoscopic surgery are associated with less pain and intraoperative complications, as well as better cosmetic outcomes and patient satisfaction [17]. In this study, the possible effects of reducing the number of ports in TLH operations performed in patients with similar indications and in which patients they can be preferred were tried to be evaluated. In our study, we compared the use of four ports and three ports in TLH operations. In all cases, the camera port (10mm) was placed 0-3cm above the umbilicus according to the size of the uterus. Proper trocar position provides adequate operative field vision and adequate mobility for instruments. Especially in cases with a large uterus, the supraumbilical camera port entry is important for a wide field of view [18]. Considering that the normal uterus weight is approximately 70 grams in an adult woman, the average uterus weight (205 grams) found in this study was found above normal. On the other hand, when the weight of the uterus exceeds approximately 280 grams, it is generally considered large and it is generally recommended to use 4 or more ports in laparoscopic hysterectomies above this weight [19]. In our study, the mean uterine weight (193 grams) of the patients we used 3 ports was significantly lower than the uterine weight (243 grams) of the patients who we used 4 ports, in line with the literature.

In our study, history of previous laparotomic abdominal surgery was similar for both groups. In addition, the rates of additional adhesiolysis were similar in both groups. This means that even if a previous abdominal surgery causes intra-abdominal adhesions, it will not be a limiting factor for reducing the number of ports. It is known that complication rates increase in subsequent abdominal surgeries, especially in women who have had a previous cesarean section [20]. However, it is difficult to predict the possible effects of previous abdominal surgeries for the hysterectomy type [21]. Previous abdominal surgeries are no longer considered risk factors for complications of laparoscopic surgery [7].

In this study, although the blood parameters were higher and the need for blood transfusion was lower in the port-3 group, it could not reach statistical significance. Since larger uteruses have more vascular structure, the need for blood transfusion is higher in patients both because of preoperative abnormal uterine bleeding and because of intraoperative bleeding [19]. A large uterus can lead to limited vision and instrument movement, and an increase in complications such as bleeding, urinary and bowel injury [22]. In this study, there was no significant difference between the two groups in terms of intraoperative and postoperative complications. There were no intraoperative complications in the Port-3 group, and there were no major complications such as urinary system and bowel injuries in both groups. In addition, total operation times were significantly shorter in the port-3 group (an average of 69 minutes) in our study. Zeng et al. described a three-port technique for laparoscopic hysterectomy in patients with a large uterus (over 800 g) in a case series of 18 patients with a mean duration of 107 minutes [19]. Tyan et al., in their study comparing the use of 2 and 4 ports in TLH, found shorter operative time and less blood loss in the 2-port group with a smaller weight (mean 143.1gr) uterus, similar to our results. In the same study, intraoperative and postoperative complication rates were similar between the groups [23].

In terms of operation indications, the cases in which uterine myomatosis and adenomyosis were seen together were significantly higher in the port-4 group. It is natural that more ports are needed for more uterine manipulation in laparoscopic surgeries performed in large uteruses.

Screening for surgical indications that only increase uterine weight and evaluating factors that may change the management of surgery, such as previous surgeries and uterine weight, are the strengths of the study. This study has some limitations. First, it is a retrospective study with a small sample size. Second, the fact that all surgeries are performed by the same surgical team may reduce the generalization probability of laparoscopic surgery, which requires personal experience and skill.

In this study, classical laparoscopic hysterectomy steps were evaluated in benign gynecological pathologies that only increase the size of the uterus by reducing the number of ports, rather than a new technique. In conclusion, reducing the number of ports up to a certain uterine weight in total laparoscopic hysterectomies, including women with a history of abdominal surgery, may be beneficial for shorter operation time, fewer intraoperative complications, and better cosmetic results.

Scientific Responsibility Statement

The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.

Animal and human rights statement
All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Funding: *None*

Conflict of interest
The authors declare no conflict of interest.

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How to cite this article:
Aylin Önder Dirican. *Evaluation of the use of three ports in total laparoscopic hysterectomies. Ann Clin Anal Med 2023;14(9):816-820*

This study was approved by the Clinical Research Ethics Committee of Karatay University Faculty of Medicine (Date: 2023-05-25, No: 2023/029)